Formulation of a methodology to calculate storage capacities in coal seams - 2007

- Component of the National Assessment
- One of three types of reservoirs being heartily considered
- Necessary for realistic appraisal of sequestration resource

Challenges:

- Difficult to deconvolve “economics” from assessment
- Wide variance in levels of certainty or knowledge
- Actual performance of coals is largely untested
  - Variety of ranks/maceral types/minerals in cleats

Advantages:

- Relatively limited resource
  - Finite number of seams/basins
  - Some basic data on most seams
- Finite variety of lithotypes and characteristics
- Significant work on adsorption/desorption behavior because of CBM R&D

Starting point for 2007 methodology:

- Previous calculations were largely based on a volumetric approach
- “Unminability” was considered by most partnerships
- Granularity was highly variable in previous compilation
- Boundaries of basins (Partnerships) was not clear

Considerations for 2007 methodology:

- Formula
- Efficiency
- Granularity
- Coal Available for Sequestration (Unminable)
- Data Reporting/Quality Control

Formula for calculating storage capacity :

- Formula unchanged from previous methodology:
  - $G_{CO2} = A\ h\ C\ \rho\ E$
- Each partnership to decide appropriate values for C (CO_2 adsorption per unit of coal volume)
- Standard CO2 adsorption isotherms to be used.
- If no values available, one can be provided
- No terms to be added for free or absorbed gas

Efficiency:

- Considerations of only technical and geological terms allowed
  - no cultural, societal or economic factors considered
- Swelling and shrinking are ignored
  - Injectability can be modified by technology
- “Limited reservoir” seams not considered
- For ease of calculation pressure and temperature can be assumed constant
- CO2 adsorption is essentially constant with rank
  - not necessary to consider but possible

Granularity:

- Capacity will be minimally calculated on a basin scale
- When data is available, calculations are to made on a seam by seam basis
- For comparative purposes finer grained calculations can be aggregated

Coal Available for Sequestration (unminable):

- Must be basin specific.
- Must use current mining industry/regulatory criteria
  - May consider thickness, depth, block size, quality characteristics
  - No “booked reserves” considered
- Must have waters that exceed 10,000 mg/l TDS
- Must have greater than 1 md of permeability

Data Reporting/Calculations:

- Minimum size cell for use in a GIS to calculate results is 10 km x 10 km
- Cells can be assigned an individual value for pressure (0.43 lbs/ft if unknown) and temperature to tailor the adsorptive capacity (C)
- All assumptions and changes are to be reviewed by the coal subgroup
  - Can vary formula with justification/explanation
- Data density and quality to be addressed later

Unresolved Performance Issues:

- Swelling
  - Irreversible?
  - Reversible? (“shocking” the coal)
- Miscibility
- Salinity of formation water
  - Precipitants/flocculants
  - Dissolution/migration
- Recoverability of CH4

Unresolved Assessment/Reporting Issues:

- Comparability of regional parameters
- Confidence values
  - Intrinsic reservoir properties
  - Data density properties
- Minability
  - Regional vs. other
- Inject ability
  - K cutoff vs. technology/economics